What is Claimed is:

1. A method of scanning an optical beam, comprising:

optically coupling at least a first beam and a second beam to an optical conduit;

encoding at least information about a set of one or more positions of the optical conduit on at least the second beam;

measuring at least the set of one or more positions of the optical conduit from at least the second beam;

bending at least the optical conduit, at least partly in response at least to measuring the set of one or more positions of the optical conduit; and

modifying at least the first beam exiting a distal end of the optical conduit.

2. The method of claim 1, wherein bending the optical conduit includes:

determining the set of one or more positions of the optical conduit in response to at least controlling one or more of: one or more magnetic fields and one or more electric fields.

3. The method of claim 1, wherein bending the optical conduit includes:

determining the set of one or more positions of the optical conduit in response to at least controlling one or more of: one or more piezoelectric drives and one or more motor drives.

4. An optical beam scanner apparatus, comprising:

an optical conduit conveying at least a first beam;

an actuator connected to at least the optical conduit;

a motivator at least partly inducing motion in at least the actuator, the optical conduit connected to the actuator, and the first beam exiting a distal end of the optical conduit;

a patterned optical element encoding at least a set of positions of the optical conduit on at least part of at least a second beam; and

a servo driving at least the motivator at least partly in response to at least the encoded positions on the second beam.

5. The apparatus of claim 4, wherein the patterned optical element includes at least one bar pattern.

6. The apparatus of claim 4, wherein the patterned optical element includes at least one shaded pattern.

7. The apparatus of 6, wherein the at least one shaded pattern includes at least one gradual shading pattern.

8. The apparatus of claim 4, wherein the optical conduit includes a light pipe.

9. The apparatus of claim 8, wherein the light pipe is fabricated from at least a rod.

10. The apparatus of claim 8, wherein the light pipe is fabricated from at least a tube.

11. The apparatus of claim 4, wherein a cross-section of the optical conduit substantially has at least one of the following shapes: a circle, an annulus, a square, a rectangle, and an oval.

12. The apparatus of claim 4, wherein the optical conduit has at least an electrically conductive coating.

13. The apparatus of claim 4, wherein the optical conduit includes an optical fiber.

14. The apparatus of claim 4, wherein the optical conduit includes:
a core;
a cladding about the core; and
a reflective coating about the cladding.

15. The apparatus of claim 4, wherein the position sensor includes a capacitor plate, and the position sensor measures a capacitance between an electrical conductor connected to the optical conduit and the capacitor plate, and thereby at least partly measures the first set of one or more positions of the optical conduit.

16. The apparatus of claim 4, wherein the motivator includes a motor driver.

17. The apparatus of claim 4, wherein the motivator includes a piezoelectric driver.

18. The apparatus of claim 4, wherein the motivator includes a field generator generating a field.

19. The apparatus of claim 18, wherein the actuator includes an electrical conductor connected to the optical conduit, the field generator includes a capacitor plate generating the field, and the field includes an electric field.

20. The apparatus of claim 19, wherein the position sensor includes a capacitor plate, and the position sensor measures a capacitance between the electrical conductor and the capacitor plate, and thereby at least partly measures the first set of one or more positions of the optical conduit.

21. The apparatus of claim 18, wherein the actuator includes a permanent magnet connected to the optical conduit, the field generator includes an electromagnet generating the field, and the field includes a magnetic field.

22. The apparatus of claim 4, wherein the optical conduit is made out of at least plastic.

23. The apparatus of claim 4, wherein the optical conduit is made out of at least glass.

24. The apparatus of claim 4, further comprising:

a light source generating light optically coupled to the optical conduit; and

a detector array optically coupled to the optical conduit,

wherein the optical conduit blocks a portion of the light generated by the light source, thereby creating a shadow falling on the detector array and generating a signal that at least partly measures the first set of one or more positions of the optical conduit.

25. The apparatus of claim 4, further comprising:

a light source generating light optically coupled to the optical conduit;

a lens optically coupled to the optical conduit; and

a detector array optically coupled to the lens,

wherein the optical conduit reflects a portion of the light generated by the light source through at least the lens onto at least the detector array, thereby generating a signal that at least partly measures the first set of one or more positions of the optical conduit.

26. The apparatus of claim 4, further comprising:

a light source generating light optically coupled into the optical conduit;

a beam splitter optically coupled to light exiting the optical conduit; and

a position sensing detector optically coupled to light exiting the optical conduit via at least the beam splitter,

wherein light exiting the optical conduit falls on the position sensing detector, thereby generating a signal that at least partly measures the first set of one or more positions of the optical conduit.

27. The apparatus of claim 4, further comprising:

a chamber enclosing at least: a portion of the optical conduit including a distal end of the optical conduit, and the actuator,

wherein the chamber is capable of maintaining a pressure difference between an inside of the chamber and an outside of the chamber, and the chamber allows at least one of one or more magnetic fields and one or more electric fields to pass through at least a portion of one or more walls of the chamber to the inside of the chamber from the outside of the chamber;

a seal in the chamber,

wherein the seal holds the optical conduit, and the seal allows at least the optical conduit to enter the chamber, and the seal allows the pressure difference to be maintained between the inside of the chamber and the outside of the chamber; and

a window sealed in the chamber,

wherein the window allows at least a portion of a beam exiting the distal end of the optical conduit to leave the chamber.

28. An optical beam scanner apparatus, comprising:

one or more optical conduits conveying at least a first set of beams;

one or more actuators connected to at least the one or more optical conduits;

one or more motivators at least partly inducing motion in at least the one or more actuators, the one or more optical conduits connected to the one or more actuators, and the first set of beams exiting distal ends of the one or more optical conduits;

one or more patterned optical elements encoding at least positions of the one or more optical conduits on at least part of at least the second set of beams; and

one or more servos driving at least the one or more motivators at least partly in response to at least the encoded positions on the second set of beams.

29. The apparatus of claim 28, wherein the one or more patterned optical elements include at least one bar pattern.

30. The apparatus of claim 28, wherein the one or more patterned optical element include at least one shaded pattern.

31. The apparatus of claim 30, wherein the at least one shaded pattern includes at least one gradual shaded pattern.

32. The apparatus of claim 28, further comprising:

one or more light sources generating light conveyed by the one or more optical conduits; and

one or more detectors optically coupled to the one or more patterned optical elements.

33. The apparatus of claim 28, wherein at least two of the optical conduits are connected to form a multiple conduit structure, and the multiple conduit structure has different stiffnesses in a first and a second direction.

34. The apparatus of claim 28, wherein the one or more motivators include one or more field generators generating one or more fields.

35. The apparatus of claim 34, wherein the one or more servos drive the one or more field generators to generate a raster scan pattern of distal ends of the one or more optical conduits.

36. The apparatus of claim 34, wherein the one or more servos drive the one or more field generators to generate a vector scan pattern of distal ends of the one or more optical conduits.

37. The apparatus of claim 34, wherein the one or more servos drive the one or more field generators to generate a combination of a raster scan pattern and a vector scan pattern of distal ends of the one or more optical conduits.

38. A telescope apparatus, comprising:

one or more optical conduits conveying at least a first set of beams;

one or more actuators connected to at least the one or more optical conduits;

one or more motivators at least partly inducing motion in at least the one or more actuators, the one or more optical conduits connected to the one or more actuators, and the first set of beams exiting distal ends of the one or more optical conduits;

one or more patterned optical elements encoding at least positions of the one or more optical conduits on at least part of at least the second set of beams;

one or more servos driving at least the one or more motivators at least partly in response to at least the encoded positions on the second set of beams;

one or more telescope lenses optically coupled at least to distal ends of the optical conduits;

one or more beam splitters optically coupled at least to the one or more optical conduits; and

one or more detectors optically coupled at least to the one or more beam splitters,

wherein light from the first set of beams is optically coupled at least to a target and optically coupled at least to the one or more detectors, thereby producing at least one or more electrical signals at at least the one or more detectors in response to at least one or more positions at the target and in response to at least optical properties of the target at the one or more positions.

39. The apparatus of claim 38, wherein the one or more servos drive the one or more motivators to generate a combination of a raster scan pattern and a vector scan pattern of the distal ends of the one or more optical conduits.

40. The apparatus of claim 39, further comprising:

a controller receiving electrical signals representing the combination of the raster scan pattern and the vector scan pattern and receiving the one or more electrical signals produced by the one or more detectors, and generating one or more display signals.

41. The apparatus of claim 38, wherein the one or more detectors includes at least one heterodyne detector allowing synchronous detection.

42. The apparatus of claim 38, wherein the one or more detectors includes at least one coherence detector allowing at least one time gate.

43. A telescope apparatus, comprising:

one or more optical conduits conveying at least a first set of beams;

one or more patterned optical elements encoding at least positions of the one or more optical conduits on at least part of at least the second set of beams;

one or more servos at least partly inducing motion in at least the one or more optical and the first set of beams exiting distal ends of the one or more optical conduits, at least partly in response to at least the encoded positions on the second set of beams; and

one or more telescope lenses optically coupled at least to distal ends of the optical conduits,

wherein light from the first set of beams is optically coupled at least to a target and optically coupled at least to the one or more telescope lenses, thereby producing at least one or more signals in response to at least the target.

44. A telescope apparatus, comprising:

one or more optical conduits conveying at least a first set of beams;

one or more actuators connected to at least the one or more optical conduits;

one or more motivators at least partly inducing motion in at least the one or more actuators, the one or more optical conduits connected to the one or more actuators, and the first set of beams exiting distal ends of the one or more optical conduits;

one or more patterned optical elements encoding at least positions of the one or more optical conduits on at least part of at least the second set of beams;

one or more servos driving at least the one or more motivators at least partly in response to at least the encoded positions on the second set of beams;

one or more telescope mirrors optically coupled to at least the distal ends of the one or more optical conduits;

one or more beam splitters optically coupled to at least the one or more optical conduits; and

one or more detectors optically coupled to at least the one or more beam splitters,

wherein light from the first set of beams is optically coupled to at least a target and optically coupled to at least the one or more detectors, thereby producing at least one or more electrical signals at at least the one or more detectors in response to at least one or more positions at the target and in response to at least optical properties of the target at the one or more positions.

45. The apparatus of claim 44, wherein the one or more servos drive the one or more motivators to generate a combination of a raster scan pattern and a vector scan pattern of the distal ends of the one or more optical conduits.

46. The apparatus of claim 45, further comprising:

a controller receiving electrical signals representing the combination of the raster scan pattern and the vector scan pattern and receiving the one or more electrical signals produced by the one or more detectors, and generating one or more display signals.

47. The apparatus of claim 44, wherein one or more telescope mirrors includes at least two telescope mirrors.

48. The apparatus of claim 44, wherein one or more telescope mirrors includes a single telescope mirror.

49. The apparatus of claim 44, wherein the distal ends of the optical conduits are positioned at a prime focus of the one or more telescope mirrors.

50. The apparatus of claim 44, wherein the one or more detectors includes at least one heterodyne detector allowing synchronous detection.

51. The apparatus of claim 44, wherein the one or more detectors includes at least one coherence detector allowing at least one time gate.

52. A telescope apparatus, comprising:

one or more optical conduits conveying at least a first set of beams;

one or more patterned optical elements encoding at least positions of the one or more optical conduits on at least part of at least the second set of beams;

one or more servos at least partly inducing motion in at least the one or more optical conduits and the first set of beams exiting distal ends of the one or more optical conduits, at least partly in response to at least the encoded positions on the second set of beams; and

one or more telescope mirrors optically coupled to at least the distal ends of the one or more optical conduits,

wherein light from the first set of beams is optically coupled to at least a target and optically coupled to at least the one or more telescope mirrors, thereby producing at least one or more signals in response to the target.

53. A display apparatus, comprising:

a first set of light sources generating at least a first set of beams;

a second set of light sources generating at least a second set of beams;

one or more optical conduits conveying at least the first set of beams;

a screen optically coupled at least to the one or more optical conduits;

one or more actuators connected to at least the one or more optical conduits;

one or more motivators at least partly inducing motion in at least the one or more actuators, the one or more optical conduits connected to the one or more actuators, and the first set of beams exiting distal ends of the one or more optical conduits;

one or more patterned optical elements encoding at least positions of the one or more optical conduits on at least part of at least the second set of beams;

one or more servos driving at least the one or more motivators at least partly in response to at least the encoded positions on the second set of beams; and

one or more controllers electrically connected to at least the first set of light sources and electrically connected to at least the one or more servos,

wherein the first set of light sources is modulated at least in intensity by at least the one or more controllers, thereby producing a picture display on the screen.

54. The apparatus of claim 53, wherein the one or more servos drive the one or more motivators to generate a raster scan pattern of distal ends of the one or more optical conduits.

55. A display apparatus, comprising:

a first set of light sources generating at least a first set of beams;

a second set of light sources generating at least a second set of beams;

one or more optical conduits conveying at least the first set of beams;

a screen optically coupled at least to the one or more optical conduits;

one or more patterned optical elements encoding at least positions of the one or more optical conduits on at least part of at least the second set of beams; and

one or more servos at least partly inducing motion in at least the one or more optical conduits and the first set of beams exiting distal ends of the one or more optical conduit, at least partly in response to at least the encoded positions on the second set of beams.

56. An optical cross port switch apparatus, comprising:

an input array, including:

an input array of a second set of light sources generating at least an input array of a second set of beams;

an input array of one or more optical conduits conveying at least an input array of a first set of beams;

an input array of one or more actuators connected at least to the input array of one or more optical conduits;

an input array of one or more motivators at least partly inducing motion in at least the input array of one or more actuators, the input array of one or more optical

conduits connected to the input array of one or more actuators, and the input array of the first set of beams exiting distal ends of the input array of one or more optical conduits;

an input array of one or more patterned optical elements encoding at least positions of the input array of one or more optical conduits on at least part of at least the input array of second set of beams;

an input array of one or more servos driving at least the input array of one or more motivators at least partly in response to at least the encoded positions on the input array of the second set of beams; and

an input array of one or more controllers electrically connected to at least the input array of the second set of one or more light sources and electrically connected to at least the input array of one or more servos; and

an output array, including:

an output array of a second set of light sources generating at least an output array of a second set of beams;

an output array of one or more optical conduits conveying at least an output array of a first set of beams;

an output array of one or more actuators connected to at least the output array of one or more optical conduits;

an output array of one or more motivators at least partly inducing motion in at least the output array of one or more actuators, the output array of one or more optical conduits connected to the output array of one or more actuators, and the output array of the first set of beams exiting distal ends of the output array of one or more optical conduits;

an output array of one or more patterned optical elements encoding at least positions of the output array of one or more optical conduits on at least part of at least the output array of second set of beams;

an output array of one or more servos driving at least the output array of one or more motivators at least partly in response to at least the encoded positions on the output array of the second set of beams; and

an output array of one or more controllers electrically connected to at least the output array of the second set of one or more light sources and electrically connected to at least the output array of one or more servos,

wherein at least one beam of the input array of the first set of beams exiting from the input array of optical conduits is optically coupleable into at least one optical conduit of the output array of optical conduits.

57. The apparatus of claim 56, wherein the input array of one or more servos drive the input array of one or more motivators to generate an input array vector scan pattern of distal ends of the input array of one or more optical conduits, and wherein the output array of one or more servos drive the output array of one or more motivators to generate an output array vector scan pattern of distal ends of the output array of one or more optical conduits.

58. An optical cross port switch apparatus, comprising:

an input array, including:

an input array of a second set of light sources generating at least an input array of a second set of beams;

an input array of one or more optical conduits conveying at least an input array of a first set of beams;

an input array of one or more patterned optical elements encoding at least positions of the input array of one or more optical conduits on at least part of at least the input array of second set of beams; and

an input array of one or more servos at least partly inducing motion in at least the input array of one or more optical conduits and the input array of the first set of beams exiting distal ends of the one or more optical conduits, at least partly in response to at least the encoded positions on the input array of the second set of beams; and

an output array, including:

an output array of a second set of light sources generating at least an output array of a second set of beams;

an output array of one or more optical conduits conveying at least an output array of a first set of beams;

an output array of one or more patterned optical elements encoding at least positions of the output array of one or more optical conduits on at least part of at least the output array of second set of beams;

an output array of one or more servos at least partly inducing motion in at least the output array of one or more optical conduits and the output array of the first set

of beams exiting distal ends of the one or more optical conduits, at least partly in response to at least the encoded positions on the output array of the second set of beams; and

wherein at least one beam of the input array of the first set of beams exiting from the input array of optical conduits is optically coupleable into at least one optical conduit of the output array of optical conduits.

59. An optical microscope apparatus, comprising:

a first set of light sources generating at least a first set of beams;

a second set of light sources generating at least a second set of beams;

one or more optical conduits conveying at least the first set of beams;

one or more actuators connected to at least the one or more optical conduits;

one or more motivators at least partly inducing motion in at least the one or more actuators, the one or more optical conduits connected to the one or more actuators, and the first set of beams exiting distal ends of the one or more optical conduits;

one or more patterned optical elements encoding at least positions of the one or more optical conduits on at least part of at least the second set of beams;

one or more servos driving at least the one or more motivators at least partly in response to at least the encoded positions on the second set of beams;

one or more beam splitters optically coupled to at least the one or more optical conduits; and

one or more detectors optically coupled to at least the one or more beam splitters,

wherein the first set of beams is optically coupled to at least a specimen and optically coupled to at least the one or more detectors, thereby producing at least one or more electrical signals at at least the one or more detectors in response to at least one or more positions at the specimen and in response to at least optical properties of the specimen at the one or more positions.

60. The apparatus of claim 59, wherein the one or more servos drive the one or more motivators to generate a combination of a raster scan pattern and a vector scan pattern of distal ends of the one or more optical conduits.

61. The apparatus of claim 60, further comprising:

a controller receiving electrical signals representing the combination of the raster scan pattern and the vector scan pattern and receiving the one or more electrical signals produced by the one or more detectors, and generating one or more display signals.

62. The apparatus of claim 59, wherein the one or more detectors includes at least one heterodyne detector allowing synchronous detection.

63. The apparatus of claim 59, wherein the one or more detectors includes at least one coherence detector allowing at least one time gate.

64. An optical microscope apparatus, comprising:

a first set of light sources generating at least a first set of beams;

a second set of light sources generating at least a second set of beams;

one or more optical conduits conveying at least the first set of beams;

one or more patterned optical elements encoding at least positions of the one or more optical conduits on at least part of at least the second set of beams; and

one or more servos at least partly inducing motion in at least the one or more optical conduits and the first set of beams exiting distal ends of the one or more optical conduits, at least partly in response to at least the encoded positions on the second set of beams,

wherein the first set of beams is optically coupled to at least a specimen, thereby producing at least one or more signals in response to at least the specimen.

65. An optical disc head apparatus, comprising:

a set of light sources generating at least a set of beams;

one or more optical conduits conveying at least the set of beams;

one or more actuators connected to at least the one or more optical conduits;

one or more motivators at least partly inducing motion in at least the one or more actuators, the one or more optical conduits connected to the one or more actuators, and the set of beams exiting distal ends of the one or more optical conduits;

one or more optical discs including one or more patterned optical elements encoding at least positions of the one or more optical conduits on at least part of at least the set of beams exiting distal ends of the one or more optical conduits;

one or more servos driving at least the one or more motivators at least partly in response to at least the encoded positions on the set of beams;

one or more beam splitters optically coupled to at least the one or more optical conduits; and

one or more detectors optically coupled to at least the one or more beam splitters,

wherein the set of beams is optically coupled to at least the one or more optical discs and optically coupled to at least the one or more detectors, thereby producing at least one or more signals at at least the one or more detectors in response to at least the one or more patterned optical elements on the one or more optical discs and in response to at least optical properties of the one or more optical discs.

66. The apparatus of claim 65, wherein the one or more servos drive the one or more motivators to generate a combination of a raster scan pattern and a vector scan pattern of distal ends of the one or more optical conduits.

67. The apparatus of claim 66, further comprising:

a controller receiving electrical signals representing the combination of the raster scan pattern and the vector scan pattern and receiving the one or more electrical signals produced by the one or more detectors, and generating one or more signals representing the data stored on the one or more optical discs, the data stored on the one or more optical discs represented by the optical properties of the one or more optical discs.

68. The apparatus of claim 66, further comprising:

a controller receiving electrical signals representing the combination of the raster scan pattern and the vector scan pattern and receiving the one or more electrical signals produced by the one or more detectors, and generating one or more signals representing data written on the one or more optical discs, the data written on the one or more optical discs represented by the optical properties of the one or more optical discs.

69. An optical disc head apparatus, comprising:

a set of light sources generating at least a set of beams;

one or more optical conduits conveying at least the set of beams;

one or more optical discs including one or more patterned optical elements encoding at least positions of the one or more optical conduits on at least part of at least the set of beams exiting distal ends of the one or more optical conduits;

one or more servos at least partly inducing motion in at least the one or more optical conduits and the set of beams exiting distal ends of the one or more optical conduits, at least partly in response to at least the encoded positions on the set of beams;

wherein the set of beams is optically coupled to at least the one or more optical discs, thereby producing at least one or more signals in response to at least the one or more optical discs.

70. An optical memory apparatus, comprising:

a set of light sources generating at least a set of beams;

one or more optical conduits conveying at least the set of beams;

one or more actuators connected to at least the one or more optical conduits;

one or more motivators at least partly inducing motion in at least the one or more actuators, the one or more optical conduits connected to the one or more actuators, and the set of beams exiting distal ends of the one or more optical conduits;

one or more optical recording media each including:

a substrate surface;

an optically recording material on the substrate surface; and

one or more patterned optical elements encoding at least positions of the one or more optical conduits on at least part of at least the set of beams exiting distal ends of the one or more optical conduits,

wherein the one or more optical recording media are optically coupled to at least the set of beams exiting distal ends of the optical conduits;

one or more servos driving at least the one or more motivators at least partly in response to at least the encoded positions on the set of beams;

one or more beam splitters optically coupled to at least the one or more optical conduits; and

one or more detectors optically coupled to at least the one or more beam splitters,

wherein the set of beams is optically coupled to at least the one or more optical recording media and optically coupled to at least the one or more detectors, thereby producing at least one or more signals at at least the one or more detectors in response to at least one or more positions at the one or more optical recording media and in response

to at least optical properties of the one or more optical recording media at the one or more positions.

71. The apparatus of claim 70, wherein the substrate surface is spherical.

72. The apparatus of claim 70, wherein the substrate surface is cylindrical.

73. The apparatus of claim 70, wherein the one or more servos drive the one or more motivators to generate a combination of a raster scan pattern and a vector scan pattern of distal ends of the one or more optical conduits.

74. The apparatus of claim 73, further comprising:

a controller receiving electrical signals representing the combination of the raster scan pattern and the vector scan pattern and receiving the one or more electrical signals produced by the one or more detectors, and generating one or more signals representing data stored on the optical recording media.

75. The optical memory apparatus of claim 73, further comprising:

a controller receiving electrical signals representing the combination of the raster scan pattern and the vector scan pattern and receiving the one or more electrical signals produced by the one or more detectors, and generating one or more signals representing data written on the optical recording media.

76. An optical memory apparatus, comprising:

a set of light sources generating at least a set of beams;

one or more optical conduits conveying at least the set of beams;

one or more optical recording media each including:

an optically recording material; and

one or more patterned optical elements encoding at least positions of the one or more optical conduits on at least part of at least the set of beams exiting distal ends of the one or more optical conduits,

wherein the one or more optical recording media are optically coupled to at least the set of beams exiting distal ends of the optical conduits; and

one or more servos at least partly inducing motion in at least the one or more optical conduits and the set of beams exiting distal ends of the one or more optical conduits, at least partly in response to at least the encoded positions on the set of beams,

wherein the set of beams is optically coupled to at least the one or more optical recording media, thereby producing at least one or more signals in response to at least the one or more optical recording media.

77. An optical lithography apparatus, comprising:

a set of light sources generating at least a set of beams;

one or more optical conduits conveying at least the set of beams;

one or more actuators connected to at least the one or more optical conduits;

one or more motivators at least partly inducing motion in at least the one or more actuators, the one or more optical conduits connected to the one or more actuators, and the set of beams exiting distal ends of the one or more optical conduits;

one or more photoresist media each including:

a substrate surface;

a photoresist material on the substrate surface; and

one or more patterned optical elements encoding at least positions of the one or more optical conduits on at least part of at least the set of beams exiting distal ends of the one or more optical conduits,

wherein the one or more photoresist media are optically coupled to at least the set of beams exiting distal ends of the optical conduits;

one or more servos driving at least the one or more motivators at least partly in response to at least the encoded positions on the set of beams;

one or more beam splitters optically coupled to at least the one or more optical conduits; and

one or more detectors optically coupled to at least the one or more beam splitters,

wherein the set of beams is optically coupled to at least the one or more photoresist media and optically coupled to at least the one or more detectors, thereby producing at least one or more signals at at least the one or more detectors in response to at least one or more positions at the one or more photoresist media and in response to at least optical properties of the one or more photoresist media at the one or more positions, and thereby exposing one or more lithographic patterns on the one or more photoresist media.

78. The apparatus of claim 77, wherein the substrate surface is spherical.

79. The apparatus of claim 77, wherein the substrate surface is cylindrical.

80. The apparatus of claim 77, wherein producing one or more signals at the one or more detectors in response to one or more positions at the one or more photoresist media, includes producing one or more signals at the one or more detectors in response to one or more positions of the position calibration pattern.

81. The apparatus of claim 77, wherein the one or more light sources includes one or more lasers.

82. The apparatus of claim 81, wherein the one or more lasers includes one or more excimer lasers.

83. The apparatus of claim 81, wherein the one or more lasers includes one or more Argon ion lasers.

84. The apparatus of claim 77, wherein the one or more servos drive the one or more motivators to generate a combination of a raster scan pattern and a vector scan pattern of distal ends of the one or more optical conduits.

85. The apparatus of claim 84, further comprising:

a controller receiving electrical signals representing the combination of the raster scan pattern and the vector scan pattern and receiving the one or more electrical signals produced by the one or more detectors, and writing a lithographic pattern on the photoresist media.

86. An optical lithography apparatus, comprising:

a set of light sources generating at least a set of beams;

one or more optical conduits conveying at least the set of beams;

one or more photoresist media each including:

a photoresist material; and

one or more patterned optical elements encoding at least positions of the one or more optical conduits on at least part of at least the set of beams exiting distal ends of the one or more optical conduits,

wherein the one or more photoresist media are optically coupled to at least the set of beams exiting distal ends of the optical conduits; and

one or more servos at least partly inducing motion in at least the one or more optical conduits and the set of beams exiting distal ends of the one or more optical conduits, at least partly in response to at least the encoded positions on the set of beams,

wherein the set of beams is optically coupled to at least the one or more photoresist media, thereby producing at least one or more signals in response to at least one the one or more photoresist media, and thereby exposing one or more lithographic patterns on the one or more photoresist media.